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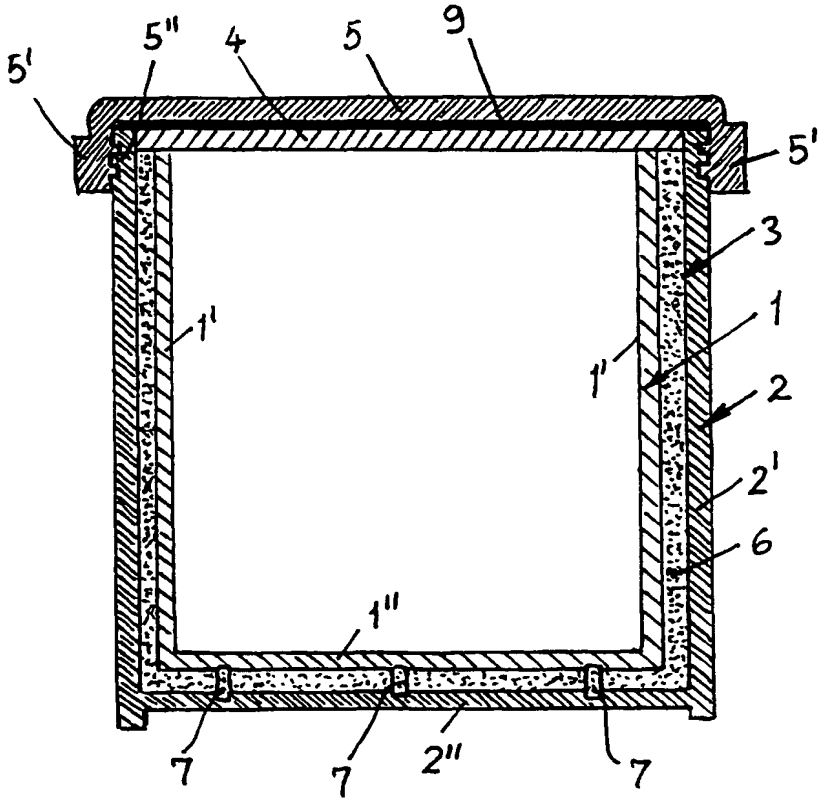
(54) Title: STORAGE CONTAINER DEVICE FOR ENCLOSING AND STORING RADIOACTIVE AND/OR ENVIRONMENTALLY POLLUTING MATERIALS




(57) Abstract: A storage container for packing and storing radioactive material, such as radioactive waste in solid or liquid form, consisting of an inner container (1), an outer container (2) spaced (3) apart from the inner container, and a lid (5) that can be fastened to the outer container. The inner container and the outer container are made of a non-ageing, heat and cold-resistant plastics material, e.g., PEH. A radiation-shielding material (6), e.g., lead, is disposed between the inner container and the outer container. The lid has a downward projecting annular portion (5') designed as a lifting ring for a lifting tool (27), and where the said portion is equipped with threads (5'') for threaded engagement with the outer container.

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# STORAGE CONTAINER DEVICE FOR ENCLOSING AND STORING RADIO-ACTIVE AND/OR ENVIRONMENTALLY POLLUTING MATERIALS.

The present invention relates to a storage container arrangement, consisting of an inner container, an outer container spaced apart from the inner container, and a lid capable of being fastened to the outer container, wherein the storage container is for packing and storing either radioactive material such as radioactive waste in solid or liquid form, or polluting material which has marked thermal expansion when subjected to heat, e.g., mercury.

Arrangements of this kind involving primarily the use of steel storage containers in the form of barrels that are filled with concrete to encase, e.g., radioactive material, are previously known.

In other cases, polluting material which has marked thermal expansion when subjected to heat is stored, which means that there is a risk of the container buckling and in some instances cracking. Containers that involve such a risk must not be used in such cases.

The object of the present invention is to provide a storage container where the storage container is easy to manufacture, is corrosion-resistant, is easy to close and provides good sealing of the contents from the surroundings, whilst the storage container itself is lower in weight than the containers commonly known for the storage of substances such as radioactive material.

According to the invention, the aforementioned arrangement for the storage of radioactive material is characterised in that the inner container and the outer container are made of a non-ageing, heat and cold resistant plastics material, e.g., high density polyethylene (PEH), that a radiation-shielding material, e.g., lead is disposed between the inner container and the outer container, and that the lid has a downward projecting annular portion designed as a lifting ring for a lifting tool, and where the said portion is equipped with threads or threaded portions either for tapping into the material of the outer container or for threaded engagement with threads or threaded portions on the outer container.

As regards the arrangement for packing and storing polluting material, as for instance mercury, this arrangement is characterised in that the inner container and the outer container are made of a non-ageing, heat and cold-resistant plastics material, e.g., high density polyethylene (PEH), that the space between the inner container and the outer container either is ventilated or is filled with a heat-insulating, preferably elastically yielding material, and that the lid has a downward projecting annular portion designed as a lifting ring for a lifting tool, and where the said portion is equipped with threads or threaded portions either for tapping into the material of the outer container or for threaded engagement with threads or threaded portions on the outer container.

Further embodiments of the invention will be apparent from the following description given with reference to the attached drawings, and from the attached patent claims.

Fig. 1 shows a storage container arrangement for packing and storing radioactive material.

Fig. 2 shows a storage container arrangement for packing and storing polluting material, as for instance mercury.

Fig. 3 shows a variant of the arrangement shown in Fig. 1.

Fig. 4 shows a variant of the arrangement shown in Fig. 2.

As shown in Figs. 1-4, there is an inner container 1; 11, an outer container 2; 12 and a space between the inner container and the outer container. The inner container has side walls 1'; 11', bottom 1''; 11'', where the side wall and the bottom are preferably made in a single piece, or optionally that the bottom is welded to the side wall, as shown in Figs. 3 and 4 respectively. Furthermore, the inner container has a lid 4; 14 capable of being fastened thereto. The outer container 2; 12 has wall 2'; 12', bottom 2''; 12'' and a suitable lid 5; 15 capable of being fastened thereto.

As indicated in Figs. 3 and 4, the inner container and/or the outer container may have their respective walls 1'; 11' and 2'; 12' made of a length of tube. The bottom 12'' can, e.g., be secured to the outer container wall 12' via flange 12''' by being welded on or screwed on. Of course, it is also conceivable that the bottom 11'' of the inner

container may be secured to the container wall 11' by being welded on, or possibly screwed on, as shown for the outer container.

It will be seen that the lid 5; 15 is provided with a uniform, downward projecting annular portion 5'; 15' that has threads or threaded portions for either tapping into the material of the outer container 2; 12, or screw engagement with threads or threaded portions 5'': 15'' in the outer container (see Figs. 1 and 2). The annular portion 5'; 15' also serves as a lifting ring for a lifting tool 27.

As will be seen from Figs. 1 and 3, a radiation-shielding material 6; 16, e.g., lead, is disposed in the said space 3; 13 between the inner container and the outer container. Before the introduction of the radiation-shielding material 6; 16, it is advantageous to place a plurality of discrete spacers 7; 17 in the space 3; 13 between the inner container 1; 11 and the outer container 2; 12, primarily between the bottom of the inner container and the bottom of the outer container. These spacers must be made of the same radiation-shielding material as the material 6; 16, e.g., lead. When filling the space with the material 6, it may be advantageous at the same time to fill the inner container wholly or partly, optionally gradually, with water for support, and as a heat sink for the hot material 6 being poured into the space.

To facilitate the positioning of the spacers, at least some of them can be affixed to the inner container and/or the outer container, e.g., with the aid of an adhesive or snap fastening.

To prevent air pockets from occurring, especially in the bottom of the storage container, one or more holes 8 (see Fig. 3) can be provided in the bottom of the inner container for evacuation of air when the radiation-shielding material 6; 16 is poured into the space between the inner container and the outer container. In tests, however, the need for such evacuation has not been found to be particularly great.

As will be apparent from Figs. 1 and 3, but also from Figs. 2 and 4, the said inner container lid 4; 14 is provided in connection with the lid 5; 15. Between these two lids 4; 14 and 5; 15 there is provided a liner 9; 19 that forms a press fit. The liner 9 can, for example, consist of a plate that is placed loose on the cover of the inner container, whereupon the outer container lid is screwed on. The lid 4 as shown in Figs. 1 and 3 is made of a radiation-shielding material, for example, lead.

In those cases when the radioactive material contains one or more substances that expand when subject to temperature variations, it is essential that the inner container should not be filled 100% with the radioactive material. It is also important in this case that a cross-section of the inner container is not covered completely by the radioactive material. It is therefore proposed according to the invention to provide the inner container with a liner 10, indicated in Fig. 3 (not shown in Fig. 1) in broken lines, which liner is preferably watertight in relation to the side walls and bottom of the inner container, and optionally can be sealed at the top. The liner should be of a material that withstands mechanical stress without cracking, and can, e.g., be made of an elastic, yielding material capable of resistance against the substances that the liner is to enclose. Elastic, yielding means 10', for example, of a heat-insulating material, may also be provided between the liner 10 and the inner container 1; 11 to absorb the expansion which may be caused by the said substance or substances when subjected to temperature variations. The expansion problems may be particularly great in connection with storage below the freezing point of water.

Although it is preferable that the inner container and the outer container should each have their side wall and bottom cast in one piece, it is also conceivable to have an inner container and /or an outer container having side walls made of a suitable length of tube, which gives cheaper production, and where the associated bottom is joined to the side wall by being welded on or screwed on.

In connection with a storage container arrangement for packing and storing polluting material which when subjected to temperature variations has a marked heat expansion, e.g., mercury, there is provided, as shown in Figs. 2 and 4, a tight inner container 11 and an outer container 12 provided with a vent hole or holes 20. At the top and/or at the bottom in the space 13 between the inner container 11 and the outer container 12, there may advantageously be provided a plurality of spacers 21-25. Of course, it will be appreciated, in particular as regards the spacers 21-25, that more of such spacers could be provided. At least some of these spacers, in particular the spacers 23, 24, are advantageously secured to the inner container 11, so that when the inner container 11 is inserted into the outer container 12, the spacers 23, 24 will accompany it. As an alternative to the holes 20 or as a supplement thereto, a vent hole 26 can be provided in the lid 15. Since the spacers 21, 22 do not necessarily need to be circumferential in relation to the top edge area of the inner container, air that is compressed in the space 13 will easily be able to escape through the opening 26 as well.

To reduce the effect of external heat on the polluting material inside the inner container, a heat-insulating material 9; 19, which may perhaps form the said press fit, can primarily be provided in the space 3; 13 between the cover of the inner container 4; 14 and the lid 5; 15 of the outer container. A heat-insulating material may also be placed in the space 13 between the inner container 11 and the outer container 12.

Although it is not shown directly on the drawings, it will be understood that the outer container 2; 12 and/or the inner container 1; 11 with associated respective lids 5; 15 and 4; 14 could be equipped with reinforcing ribs on the outside of the outer container and on the inside of the inner container respectively.

Patent claims

1.
A storage container arrangement for packing and storing radioactive material such as radioactive waste in solid or liquid form, consisting of an inner container, an outer container spaced apart from the inner container, and a lid capable of being fastened to the outer container,
characterised in
- that the inner container and the outer container are made of a non-ageing, heat and cold resistant plastics material, e.g., PEH;
- that between the inner container and the outer container there is disposed a radiation-shielding material, e.g., lead; and
- that the lid of the outer container has a downward projecting annular portion designed as a lifting ring for a lifting tool, and where said portion is equipped with threads or threaded portions either for tapping into the material of the outer container, or for threaded engagement with threads or threaded portions on the outer container.

2.
An arrangement as disclosed in claim 1, characterised in
- that a plurality of discrete spacers of the said material are placed in the said space, at least between the bottom area of the inner container and the outer container, prior to the introduction of the radiation-shielding material.

3.
An arrangement as disclosed in claim 2, characterised in
- that at least some of the spacers are secured to the inner container and/or the outer container.

4.
An arrangement as disclosed in claim 1, characterised in
- that the radiation-shielding material is introduced into said space in liquid state and made to solidify there.

5.
An arrangement as disclosed in claim 4, characterised in
- that in the inner container, preferably in the bottom thereof, there is at least one hole for evacuation of air whilst said material is poured into said space.

6.
An arrangement as disclosed in any one of the preceding claims, characterised in
- that the inner container and/or the outer container each has a side wall and bottom cast in one piece.

7.
An arrangement as disclosed in any one of the preceding claims,
characterised in
- that a lid of a radiation-shielding material, e.g., lead, is positionable on the inner container, and that the inner container lid is clampable against the top of the inner container by the clamping effect of the outer container lid.

8.
An arrangement as disclosed in any one of the preceding claims,
characterised in
- that the container is equipped with a liner that in the event of expansion of the radioactive material is compressible or elastically yielding.

9.
A storage container arrangement for packing and storing polluting material which when subjected heat has marked heat expansion, e.g., mercury, consisting of an inner container, an outer container spaced apart from the inner container, and a lid capable of being fastened to the outer container,
characterised in
- that the inner container and the outer container are made of a non-ageing, heat and cold resistant plastics material, e.g., PEH;
- that the space between the inner container and the outer container is either ventilated or filled with a heat-insulating, preferably elastically yielding material; and
- that the lid of the outer container has a downward projecting annular portion designed as a lifting ring for a lifting tool, and where said portion is equipped with threads or threaded portions either for tapping into the material of the outer container, or for threaded engagement with threads or threaded portions on the outer container.

10.
An arrangement as disclosed in claim 9, characterised in
- that a plurality of discrete spacers of the said material are positioned in said space.

11.
An arrangement as disclosed in claim 10, characterised in
- that at least some of the spacers are secured to the inner container and/or the outer container.

12.
An arrangement as disclosed in claim 9, characterised in
- that the outer container, preferably at a top part thereof, has at least one hole for evacuation of air on compression of said space.

13.
An arrangement as disclosed in claim 9, characterised in
- that in the lid and/or outer container is equipped with at least one hole for evacuation of air from the space.

14.
An arrangement as disclosed in any one of preceding claims 9-13, characterised in
- that the inner container and/or the outer container each has a side wall and bottom cast in one piece.

15.
An arrangement as disclosed in any one of preceding claims 9-14,
characterised in
- that between the outer container lid and a lid for the inner container there is a first liner, preferably of a heat-insulating material; and
- that in the space between the inner container and the outer container there is provided a second liner, preferably of a heat-insulating material.

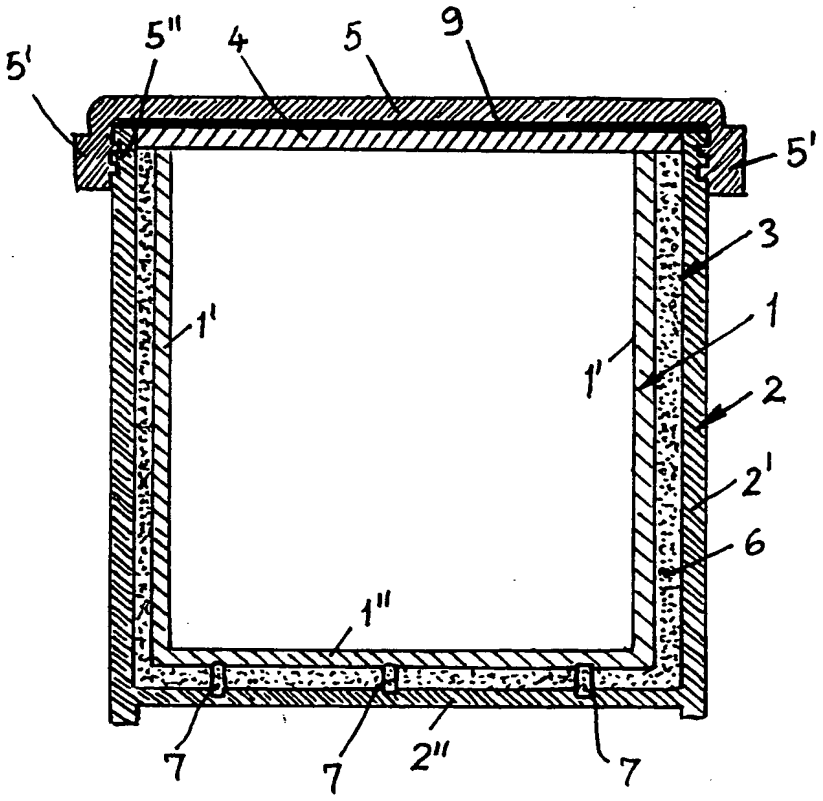



FIG. 1

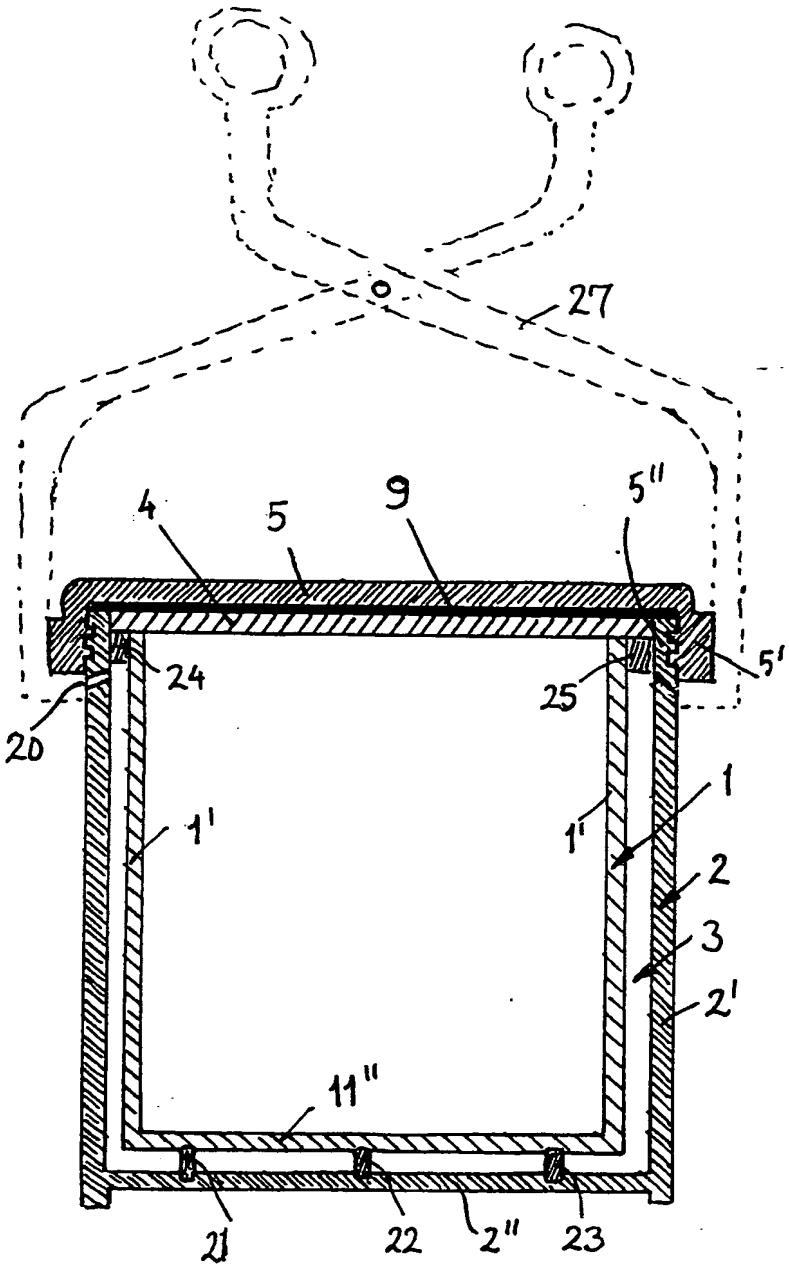



FIG. 2

FIG.3

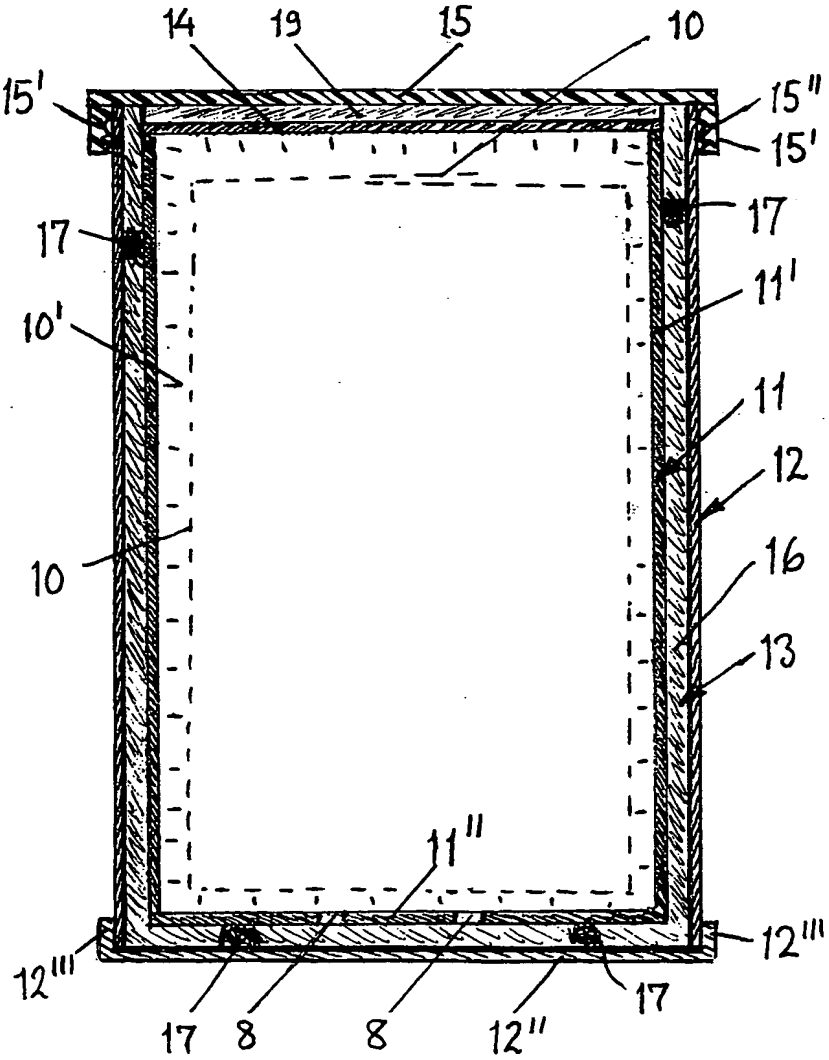
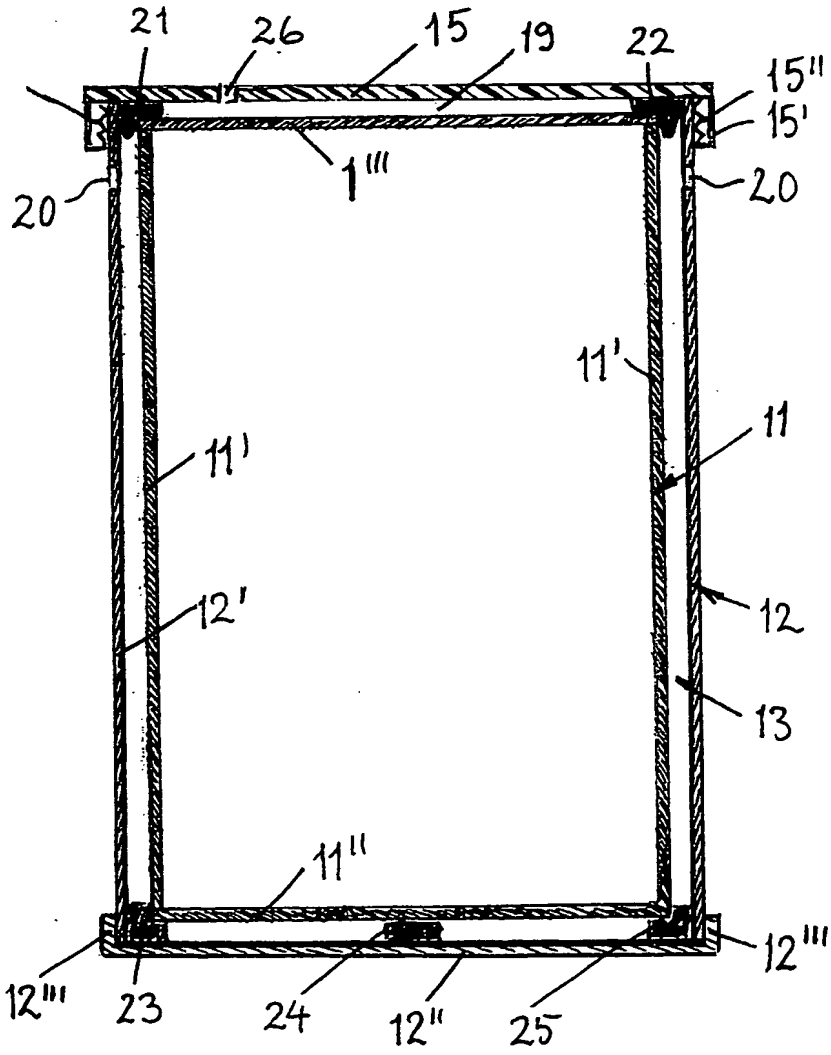


FIG. 4



# INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 01/00038

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G21F 5/005, B65D 85/84, G21F 5/12, G21F 5/002
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G21F, B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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| Y | US 5099998 A (ROY CURZON ET AL), 31 March 1992 (31.03.92), column 2, line 17 - line 47; column 3, line 58 - line 63, figure 4 | 1-15 |
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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| 9 May 2001 | 14 -05- 2001 |
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

02/04/01

International application No.
PCT/NO 01/00038

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